

CLAIMS OF THE INVENTION

I CLAIM:

1. A method for creating of laser-induced damage images with reduced sharp star structure comprising:

production of the special transparent material by introducing special kinds of impurities;

generating laser radiation and focusing it at predetermined points of said material so that the focal spot area contains at least one said impurity and laser energy exceeds the damage threshold of said material with said impurities at said focal area by a negligible amount.

2. The method in accordance with Claim 1 wherein said impurities are determined so that the damage threshold of said material is decreased but said transparent material keeps its perfect transparent properties.

3. The method in accordance with Claim 1 wherein the size of the impurities is determined so that, on the one hand, the material keeps its perfect transparent properties and on the other hand, the impurities give high effect of damage threshold reduction.

4. The method in accordance with Claim 1 wherein the concentration of said impurities and their distribution inside said material are determined so that a focal spot area of said laser radiation contains at least one impurity with high probability.

5. The method in accordance with Claim 1 wherein the materials containing said impurities undergo thermal treatment at the such conditions (at high temperature and in an oxygen atmosphere), in which the thermal treatment results in damage threshold reduction.

12. The method in accordance with Claim 8 wherein the laser beam of the said energy, said wavelength and said pulse width is generated by said first kind of laser and is periodically focused at the points of said transparent material heating said material areas to said vitrifying temperature.

5 13. The method in accordance with Claim 8 wherein the optimal focal spot size of said second kind of laser radiation is determined so that for the predetermined size of the heating area, desirable damage can be produced by a laser energy exceeding the damage threshold (breakdown threshold) by a negligible account.

10 14. The method in accordance with Claim 8 wherein said second kind of laser generates radiation, which is directed at the transparent material and focused at the point of heated area so that its laser energy exceeds said damage threshold at said area by a negligible account.

15 15. An apparatus for producing high quality laser-induced images inside optically transparent materials by using two lasers comprising:

the first laser generating radiation for heating an area of said transparent material to the vitrifying temperature;

the second laser generating radiation for creation of breakdown at a point of said material area;

20 the means for combining said first and second laser radiations, directing and focusing said radiations at said area of said transparent material;

the means for displacement of focal spots of both said radiations inside said transparent material during creating laser-induced damage images so that positional relationship of said focal spots is not modified.